NECA RURAL BROADBAND Cost Study: SUMMARY OF RESULTS

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Executive Summary

This study estimates the investment dollars needed to upgrade rural study area lines in NECA's Common Line pool[1] to broadband capability. Included in the estimate are plant upgrades on the customer side of the switch. Not included in the estimate are investment expenditures on DSL equipment, switch and backbone transport to other service areas or the ongoing maintenance of the upgraded network necessary to provide broadband services.

The results confirm two widely held beliefs about wiring rural America for broadband service[2] that seem contradictory on the surface. First, the estimated bill for completing the job is enormous, about $10.9 billion. Second, rural telephone companies are rapidly deploying a broadband capable network. According to the study's respondents, about 65% of rural lines will be capable[3] of providing broadband service by 2002. This fact, coupled with the ambitious rollout of data-network services documented in NECA's Access Market Survey[4], show that rural telephone companies are trying to meet their customers' needs for high-speed lines. Whether the pace is quick enough for policy-makers, or the targeted penetration rates are high enough for them to accept, will determine the funding needed to reach public policy objectives.

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[1] Based on the 1996 Telecommunications Act, the FCC has recognized 95 non-rural and 1301 rural LEC's (The latter includes both NECA and non-NECA companies.) Of the 1301 LEC's, 111 are companies NOT in the CL pool. A further investigation indicates that an additional 49 NECA LEC's were omitted from the FCC's rural/nonrural list. Therefore, a total of 1239 (1301-111+49) of NECA's CL pool members are Rural.

[2] The FCC defines broadband as "having the capability of supporting, in both the provider-to-consumer (downstream) and the consumer-to-provider (upstream) directions, a speed (in technical terms, 'bandwidth') in excess of 200 kilobits per second (kbps) in the last mile." Inquiry Concerning the Deployment of Advanced Telecommunications Capabilities, cc Docket No. 98-146, Report, 14FCCRcd 2398,2406(1999).

[3] A broadband capable line can potentially handle high-speed services. If the telephone company does not offer these services the line is still defined as broadband capable.

[4] National Exchange Carrier Association, Inc., Access Market Survey of NECA's Traffic Sensitive Pool Members - Keeping America Connected: The Broadband Challenge (1999)

Background

The FCC and several members of Congress have suggested the need for a targeted initiative aimed at deploying advanced telecommunications services in rural America. As defined by the Telecommunications Act of 1996 (Act), advanced telecommunications capability refers to "high speed, switched broadband telecommunications capability that enables users to originate and receive high quality voice, data, graphics, and video telecommunications using any technology."[5] A key concern is the ability to provide broadband capability in rural areas, where the cost of implementing necessary telephone network upgrades is expected to be significant.

There are a number of factors which typically increase the cost of serving customers in rural areas, such as large size of exchange areas, low line density, and scattered distribution of telephone customers. The exchanges of rural companies in NECA's Common Line pool cover 35% of the land area of the 48 contiguous states plus Hawaii, but serve just under 6% of 1990 households, or roughly 5% of 1998 USF loops.[6]

Report Highlights

The cost of upgrading rural local exchange carrier networks of NECA Common Line pool members was derived from two studies. The first was a detailed engineering study that was completed by a sample of companies that had or were in the process of upgrading their exchanges to broadband capability. This study measured the cost of upgrading lines. The second was a deployment study completed by a sample of other companies to estimate the percentage of lines that would not be upgraded to broadband capability by 2002.

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[5] Section 706 of the Pub.L. 104-104, Title VII, § 706, Feb. 8, 1996, 110 Stat. 153, reproduced in the notes under 47 USC § 157.

[6] Universal Service Fund (USF) 1999 Submission of 1998 Study Results by the National Exchange Carrier Association (Oct. 1, 1999).

The engineering study was completed by 36 study areas for 136 exchanges, representing 2.4% of all rural exchanges in NECA's common line pool. These companies split their subscriber lines into three geographic categories:

- Within the Central Dial Office Serving Area (CDOSA) - This is the area directly surrounding a central or remote dial office. Customers in this area may be served out of the central dial office on copper loops less than 18 kft. in length.
- Outside the Central Dial Office Serving Area (CDOSA) - This is the area beyond 18 kft. from the central or remote dial office but still broadband capable because distribution lines are within 18 kft. of a digital loop carrier (DLC) terminal.
- Isolated territory - This is the area where factors such as distance, sparse population, or difficult terrain make it uneconomical to upgrade loops to the DLC and copper configuration generally used to provide broadband capability for loops Outside the CDOSA.

The deployment study was completed by 88 study areas, for 108 exchanges, representing 1.9% of all rural exchanges in NECA's common line pool.

Based on the survey study results, NECA estimated the rural lines that will not be upgraded by 2002.

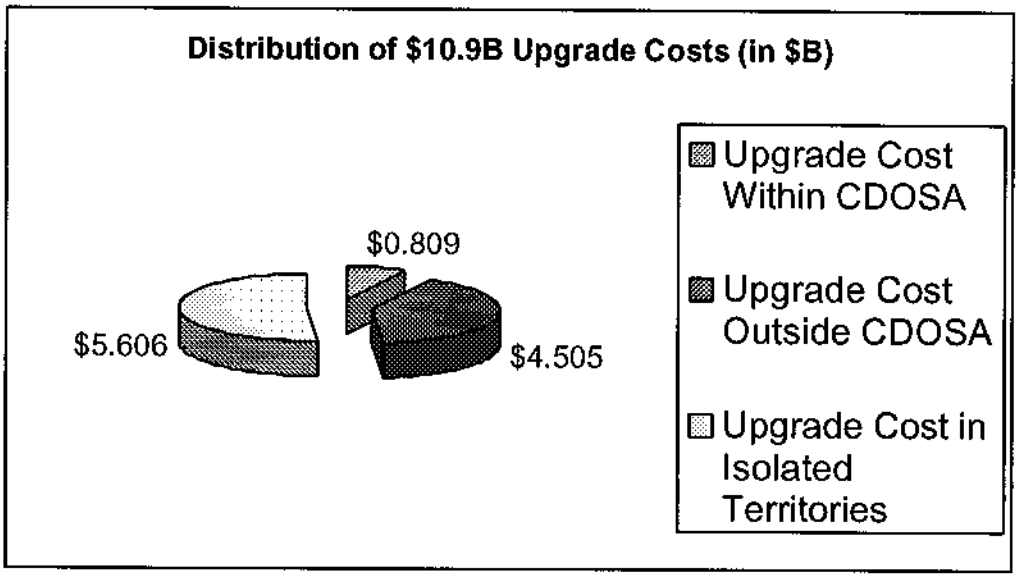
- Total Rural Lines not upgraded by 2002 — 3,333,290
  - This number is 35.0 % of the 9,520,279[7] rural lines in the Common Line Pool

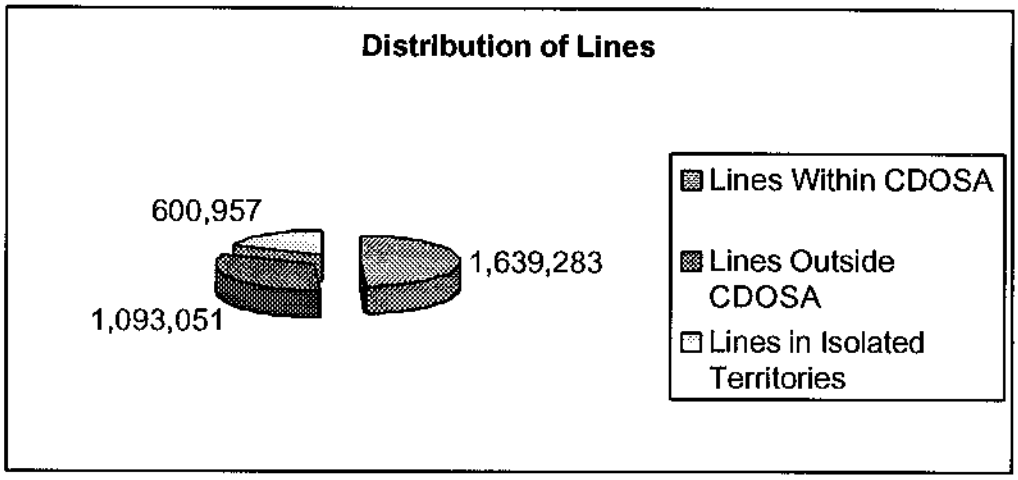
Matching these exchanges to those in the engineering study by line size and density, NECA estimated the cost of upgrading all these lines to broadband capability.

- Total Estimated Upgrade Cost [8] — $10.9B
  - Estimated cost within CDOSA 1,639,283@$493/line — $0.809B
  - Estimated cost outside CDOSA 1,093,051@ $4,121 /line — $4.505B
  - Estimated cost of Isolated Territory 600,957 @$9,328/ line — $5.606B

[7] Density and distance information were not available for 790 exchanges. Averages for the exchanges that did have detailed information were used to apportion the lines to the within CDOSA, outside CDO, and isolated territories categories.

[8] Cost per line based on average characteristics such as line size and customer density of rural exchanges not upgraded.





The engineering studies show that cable costs are by far the biggest cost component of network upgrades. Within the CDOSA they represent 63.6% of the cost upgrades and outside the CDOSA the percentage rises to 71.1%.

	Cable	Other[9]	DLC
Within CDOSA	63.6%	36.4%	0.0%
Outside CDOSA[10]	71.1%	4.0%	24.9%

[9] The category "Other" includes central office equipment within the CDOSA and miscellaneous costs (e.g. drops, NIDs, splicing, rights of way) for the outside CDOSA category.

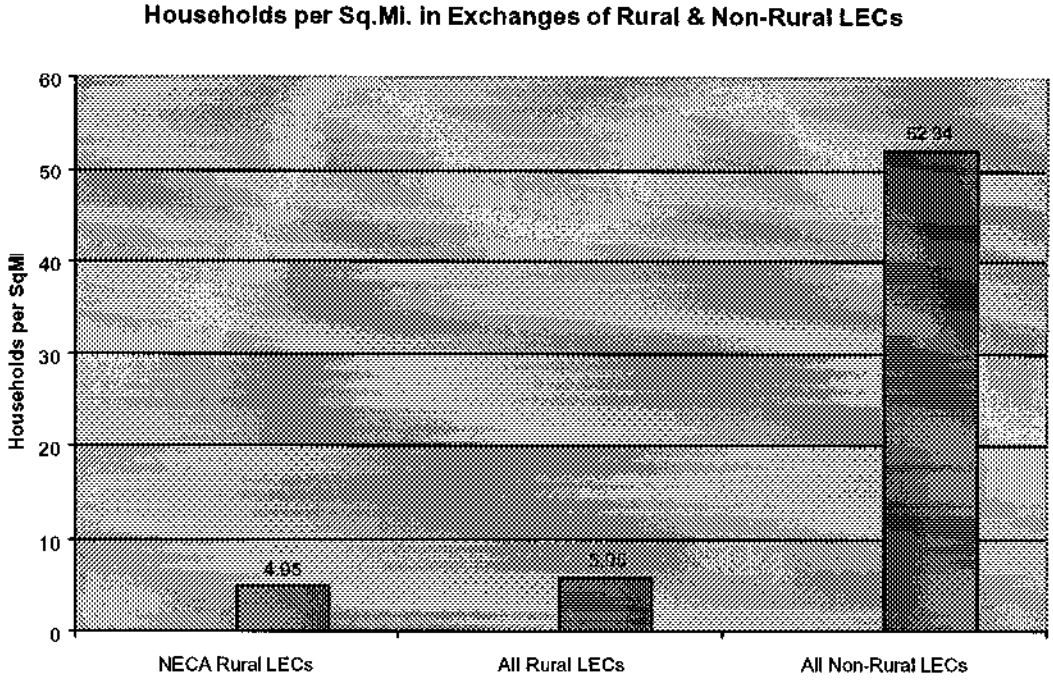
[10] Excludes DSL equipment (e.g. DSLAM's, etc.). This exclusion applies to both within and outside the CDOSA.

Contrasts

The average values given so far only tell part of the story. Upgrade costs will differ enormously among rural telephone companies because of differences in size of customer bases, locations, age and condition of their networks. These graphs, tables, and individual facts are intended to show this diversity.

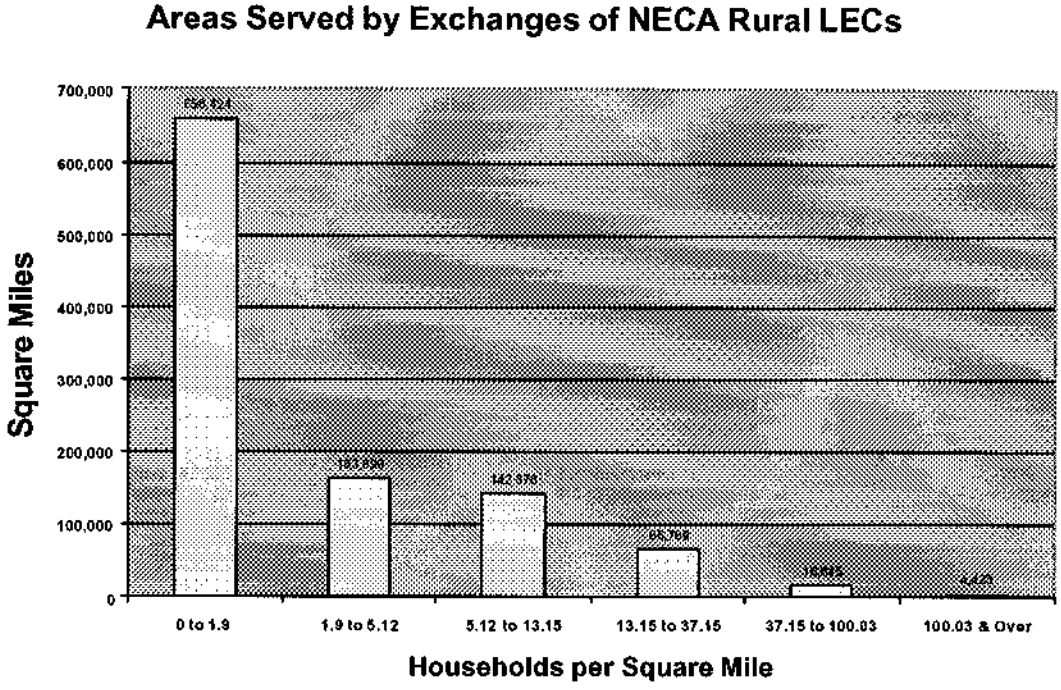
1. Households Per Square Mile – Rural vs. Non-Rural

Using 1997 Claritas exchange boundary maps, plus census block maps with 1990 household counts, the average density of households in NECA's rural LEC exchanges (Telecom Act of 1996 Definition) is 4.95 per square mile. This is roughly the same household density as the 5.95 per square mile for all rural exchanges in the 48 contiguous states plus Hawaii. In comparison, the density for all non-rural exchanges is 52.34, a roughly ten to one difference.



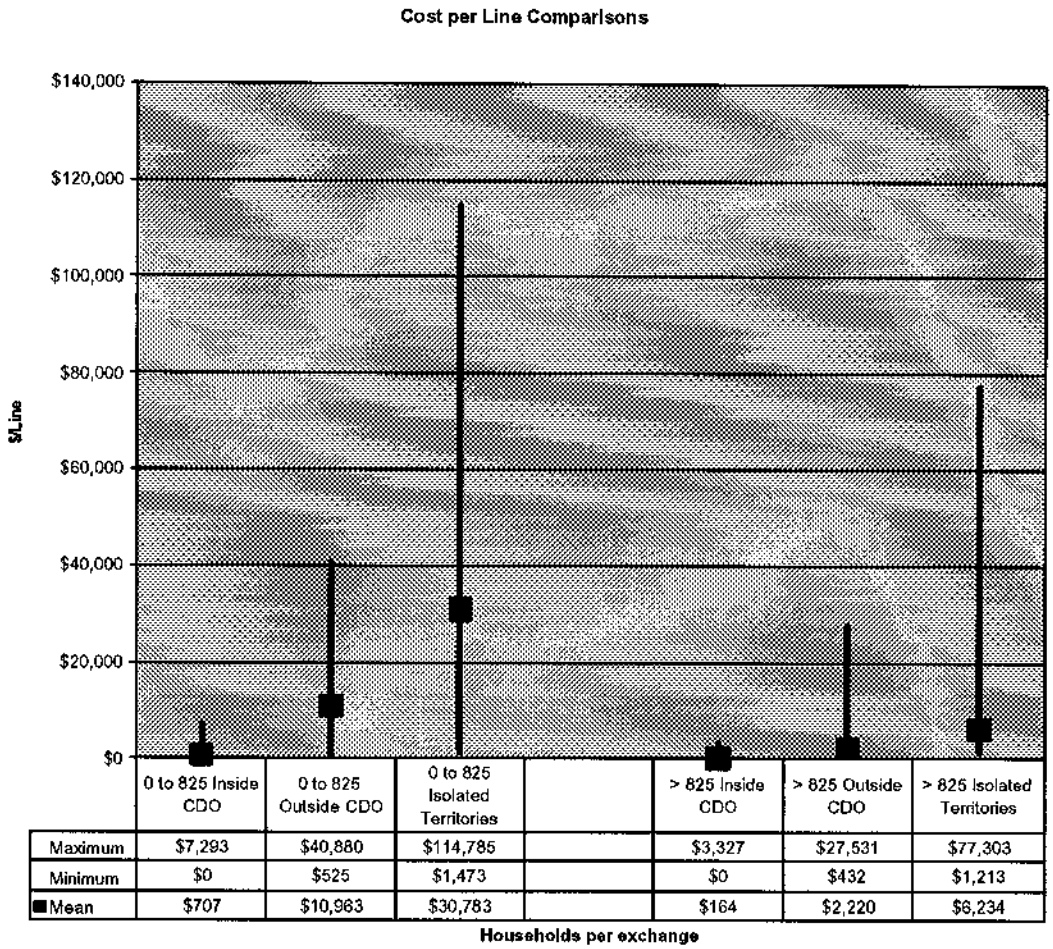
2. Square Miles of Areas Served by Household Density Grouping

Areas served by all the exchanges of NECA's rural LEC's cover just over one-third of the land area of the 48 contiguous states plus Hawaii, 1,053,239 sq. miles out of 2,986,026 sq. miles. Of the NECA rural exchanges, the ones serving fewer than 2 households per sq. mile cover 658,424 sq. miles of territory. This is about 62% of the serving territory of all rural NECA exchanges.



3. Upgrade Costs by Category Graph

The effects of low density and long loops in rural areas show clearly in the average cost of broadband upgrades. Data from the engineering study show that upgrade cost per line declines, on average, as lines per exchange increase and distance from the central dial office decreases. The tick marks on the following graph show these average declines for two exchange size groupings: exchanges with fewer than 825 households and exchanges with more than 825 households.



The graph also portrays the striking cost variability in upgrading exchanges that is not captured in average profiles. The tips of the spikes show the high and low values for a particular grouping. Within relatively uniform categories, the range of the upgrade costs per line almost completely overshadows the average, especially for the 0-825 household category.

4. Other observations:

Variability is a persistent theme in this study.

- Average customers per Digital Loop Carrier (DLC) range from 3 to 290.
- Minimum customers per DLC range from 1 to 120.
- 47 of 136 exchanges did not require an upgrade to the Outside Plant Network within the CDOSA.

Unusual expenses were also reported

- Payments for crop damage
- Archaeological surveys
- Lack of AC power

The timing of upgrades is strongly related to the age of the plant. The engineering study showed that an upgrade occurs when outside cable is at least 12-years old. Typically the age is 20-years at when the outside cable is replaced. This explains the delays in upgrading networks.

Additional Observations

- This study will be an ongoing one to keep abreast of the progress and cost of deploying broadband capability in NECA's Common Line pool.

  - NECA will continue to add new exchanges to its sample to ensure that the results are fully representative of rural wire centers in NECA's Common Line pool.
  - Isolated territory estimates are the opinions of company experts. They are not derived from actual upgrades or planned upgrades based on detailed cost analysis. The experts did not base their estimates on a predefined technology. These estimates are subject to continuing review.

APPENDIX

Study Methodology

- The study covers rural study areas that belong to NECA's Common Line Pool excluding the non-rural Common Line LECs - Puerto Rico Telephone, Roseville Telephone, Anchorage Telephone, and North State Telephone (NC).

- The total cost of upgrading rural study area lines within NECA's Common Line pool to broadband capability is based on the data collected from two complementary data requests:
  - Survey I asked for detailed cost information from exchanges with completed or planned network upgrades.
    - Responses have been received so far from 36 companies for 136 of their exchanges. This information was used to calculate Average Estimated Per Line Network Upgrade Cost
    - These LECs were asked to identify the costs of upgrading their plant to be broadband capable.
    - For the purposes of this study, broadband capability means a line speed in excess of 200 Kbps both in the upstream and downstream directions.
    - Survey I assumes that rural LECs will implement CSAs in preparation for providing broadband via DSL technology.
  - Survey II asked for the status of outside plant network upgrades from a sample of study areas that were not part of the Survey I sample
    - To date, responses have been received from 88 companies for 108 exchanges. This information was used to calculate the cost of Total Rural Lines not yet upgraded.

  - Incremental Cost for upgrading isolated territory is based on responses received from both surveys which indicate that 18.0% of upgraded lines (5.7% in exchanges not upgraded, and 12.3% in exchanges that have had major upgrades) are in isolated territory, and are estimated to cost 2.80 times more to upgrade than lines upgraded outside the CDOSA.
  - Isolated territory is defined as the area where factors such as distance, sparse population, or difficult terrain make it uneconomical to upgrade loops to the DLC and copper configuration generally used to provide broadband capability for loops Outside the CDOSA.

- Existence of Isolated Territory is attributed to factors such as low line density or terrain, which could make network upgrades prohibitively expensive for exchanges.

- For two different line size groupings, sample LECs were assigned to one of nine strata based on population density and average customer distance from the wire center. Costs from the sample were then calculated for each of the nine strata and then applied to the universe of rural LECs in the Common Line pool.